

## **ADVANCED AMPHIBIOUS ASSAULT VEHICLE (AAAV)**



### **Navy ACAT ID Program**

Total Number of Systems:	1,013
AAAV(P) Personnel Variant:	935
AAAV(C) Command Variant:	78
Total Acquisition Cost (TY\$):	\$8,469M
Average Unit Cost (TY\$):	\$6.9M
Full-rate production	
Contract Award:	1QFY07

### **Prime Contractor**

General Dynamics Land Systems

### **SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020**

The Advanced Amphibious Assault Vehicle (AAAV) is an amphibious armored personnel carrier that will replace the current Marine Corps assault amphibian—the AAV7A1. The following two variants are under development: the personnel variant (AAAV(P)), which will be armed with a 30 mm cannon and a 7.62 mm machine gun, and is intended to transport 17 combat-equipped Marines and a three-man crew; and, a command and control variant (AAAV(C)), which will carry a commander and staff. An operationally configured AAAV is expected to weigh about 37 tons and travel in excess of 20 knots in 3-foot significant wave height water conditions, and at 43 miles per hour over land.

The AAV is primarily designed to provide an over-the-horizon amphibious assault capability for Marine Air-Ground Task Force elements embarked aboard amphibious ships. Once ashore, the AAV(P) will be an armored personnel carrier, providing transportation, protection, and direct fire support to accomplish *dominant maneuver* and *precision engagement*; the AAV(C) will serve as a tactical echelon command post.

## **BACKGROUND INFORMATION**

The AAV program entered the Preliminary Design-Risk Reduction (PDRR) phase after its Milestone (MS) I in 1995. The MS II Defense Acquisition Executive (DAE) review occurred on November 29, 2000. Based on the consensus of the Integrating-Integrated Product Team, the Program accelerated the MS II DAE from 2/3QFY01 to 1QFY01. Increased funding from Congress also contributed to the Program Office's ability to accelerate the MS II decision. MS III and Initial Operating Capability are scheduled for 4QFY06.

The AAV program has made extensive use of the Integrated Product and Process Development concept in its test strategy development. The Program continues to evolve the T&E strategy and planning to best meet the needs of the Marine warfighters within tight fiscal and schedule constraints. The Program's Test and Evaluation Master Plan (TEMP) was approved by DOT&E on November 29, 2000.

The AAV is under Live Fire Test and Evaluation (LFT&E) oversight for both system survivability and system lethality. The LFT&E strategy calls for a building block approach that begins at the component level and concludes with a full-up, system-level testing of an AAV vehicle. The program completed its planned armor validation testing of selected armor coupons with the ORD-specified threats in FY99.

## **TEST & EVALUATION ACTIVITY**

DOT&E required the program to conduct operational events to support the MS II decision. The U.S. Marine Corps Operational Test and Evaluation Activity (MCOTEA) conducted an Early Operational Assessment (EOA) to support the MS II DAB review. This EOA primarily consisted of technical demonstrations and operationally oriented DT test events. MCOTEA and DOT&E also reviewed other data, including DT, user juries, and field tests. Although these tests were not operational in nature, they were expected to provide some feedback to DOT&E and the Program Office on the system's potential operational effectiveness and suitability, and provide indications of system maturity to the DAE prior to his MS II decision. Available test and analytical data from DT, conducted using PDRR prototype vehicles, were evaluated in terms of their contributions to the objectives of the developmental program, and addressed other areas of technical risk that could significantly affect achieving the program objectives. Both MCOTEA and the Program Office restructured some planned pre-MS II DT events in order to obtain operational insights.

An EOA for the command variant will be accomplished through use of the AAV(C) non-operational mockup and Systems Integration Lab (SIL) at the AAV Technological Center in Woodbridge, VA. The EOA, scheduled for 4QFY01, will use the wooden mockup, which will be updated to present a realistic representation, with reasonable fidelity, of the Command, Control, Communications, Computers, and Intelligence (C<sup>4</sup>I) suite that will be used on the Engineering and

Manufacturing Development (EMD) AAV(C) vehicle. The physical mockup of the AAV(C) internal configuration will be used for various human factor observations and insight. A functional representation of the communication suite, using operating, representative equipment in the mockup, will be used during exercises of test scenarios. A battalion and a regimental staff from the 2<sup>nd</sup> Marine Expeditionary Force (II MEF) will be used for this assessment. A Program-conducted user jury, scheduled for December 2000, will serve as a foundation for the AAV(C) EOA, and will provide insights into the Command and Control (C<sup>2</sup>) aspects of the AAV program, clarification of C<sup>2</sup> employment, and guidance to the AAV(C) EOA. This test plan is a result of close coordination and teamwork among MCOTEA, DOT&E, and the Program Office to optimize AAV(C) early operational activities to prevent redundancies of effort. As a result, the AAV(C) EOA has been re-scheduled from 4QFY00 to 4QFY01.

The Live Fire Testing and Evaluation (LFT&E) test activity during FY00 focused on the lethality of the 30 mm main gun ammunition and approval of the LFT&E strategy for assessing vehicle survivability. As part of the selection and development process for the ammunition, the program conducted firing of various high explosive and armor piercing ammunition designs against armor plates, threat vehicles, troop surrogates, watercraft targets, masonry targets, and earth and timber bunkers. All testing was conducted from test barrels or an experimental mount equipped with the Mk 44 gun. The final reports have not been provided by the PM, nor reviewed by DOT&E. Realistic lethality testing from a vehicle will be conducted in FY04.

## **TEST & EVALUATION ASSESSMENT**

The acceleration of the MS II decision, adjustments to the AAV(P) EOA timing, changes to AAV(C) requirements by the USMC, and program level schedule adjustments to facilitate alignment of funding, contracting and major decision points resulted in the reduction of previously scheduled pre-MS II operational activities. As a result, DOT&E directed the Program Office to: (1) add a pre- Low-Rate Initial Production (LRIP) operational activity from FY01/FY03 to support the first LRIP decision; (2) accelerate the EMD Phase operational test in FY04 by six months to support the second LRIP decision; (3) add a Hot Weather Assessment in FY04 that combines DT and OT activities; and (5) ensure that the maximum number of LRIP vehicles were available for use in the FY06 IOT&E.

Per the MS I TEMP, the AAV(P) EOA was originally scheduled in 4QFY01. Though intended for acceleration and completion by August 2000, the AAV(P) EOA is now scheduled between 2QFY01-4QFY01. The shift will allow additional DT to be completed while avoiding operational schedule conflicts. During the AAV(P) EOA, representative Marines will determine whether the system, when employed in an operationally realistic environment, has the potential to transport troops from an amphibious ship located over-the-horizon and then conduct sustained mechanized operations ashore with the main battle tank and other ground combat systems. This EOA should also provide an initial assessment of key factors affecting the system's operational suitability.

Risks associated with this modified test strategy include reduced system-level operational insights early in the acquisition process, reduced operational insight at the first LRIP decision point, and AAV(C) variant LRIP decisions lacking operational testing of a representative configuration. However, due to the high degree of fidelity in the PDRR AAV prototypes, and the corresponding improvements expected in EMD and LRIP articles, these risks should be mitigated. Furthermore, DOT&E and MCOTEA will be better able to identify operational effectiveness/suitability issues and risk during the conduct of each operational assessment and test event.

The Program Office will use data gathered during FY00 on the 30 mm ammunition to select high explosive ammunition for the AAV. Simulations will be conducted based on the results of these tests to predict the effectiveness of the different ammunition types against threat targets. The program then plans to fire the selected ammunition against threat targets or surrogates from the Mk 46 mount on one of the prototype vehicles in early FY04 as a system-level test.

As part of the MS I TEMP approval, DOT&E requested that the PM update appropriate portions of the LFT&E Strategy one year prior to the commencement of Ballistic Hull and Turret (BH&T) testing. The PM had worked on developing this update through late FY99 and early FY00. In 2QFY00, the PM restructured the LFT&E Strategy, and the proposal constituted a substantial change from the MS I TEMP and prior working drafts. Working with the Deputy Director for LFT, the Program's strategy now includes the reduction in full-up, system-level test articles from two EMD vehicles to one, the addition of one PDRR prototype vehicle in late FY02 for Ballistic Vulnerability Testing, and the retention of BH&T testing in FY01. The risks associated with the reduction in the number of full-up, system-level assets and test shots, may be offset by the inclusion of the Ballistic Vulnerability Testing of a full-up PDRR prototype two years earlier in the acquisition cycle. This LFT&E strategy serves to reduce full-up, system level costs by approximately \$16.4 million while only increasing EMD Phase LFT&E costs by approximately \$1.85 million, a net savings of over \$14 million.

Additionally, in response to DOT&E's request that the PM conduct limited full-up, system-level testing against the AAV(C), the Program Office has incorporated a single non-perforating ballistic test event using an EMD-AAV(C) vehicle in FY05. This event represents a realistic approach to a limited examination of the system-level vulnerabilities unique to the AAV(C) variant configuration, and minimizes risk to potential destructive effects upon the single AAV(C) EMD variant prior to IOT&E. The focus of this ballistic event is to identify risks associated with ballistic shock on the C<sup>4</sup>I Suite inside an AAV(C).

Development of the LFT&E strategy was unique in that the PM is the Marine Corps Evaluator for LFT&E. This arrangement results from the fact that SECNAV Instruction 5000.2R restricts MCOTEA involvement in LFT&E. Still unresolved at this time is how the adequacy of mine threats will be addressed. DOT&E will continue to work with the PM on this issue.

## **CONCLUSIONS AND LESSONS LEARNED**

Due to the re-scheduling of the MS II DAB forward from 3QFY01 to 1QFY01, the short-term notice has resulted in less than optimal planning periods for the identification, development, and execution of OT&E-related events. Lessons learned include coordination of either concurrent or combined DT/OT events requires extensive and early cooperation and planning between MCOTEA and the Program Office. This will become extremely important as the program begins its planning for testing to be conducted in the EMD Phase. DOT&E will work with MCOTEA on the planning, coordination, and execution of DT/OT events to ensure preparations for the conduct of the Direct Reporting PM (DRPM) AAA's pre-LRIP operational assessment are effective.

The DRPM AAA's LFT&E Strategy currently allows for the early identification of risks associated with the present design. However, challenges associated with incorporation of early contractor developmental testing into a building block LFT&E strategy continued in FY00. The PM is relying on and has referenced several contractor-conducted tests and analyses, but has not provided documentation of the results to DOT&E. In many cases, the contractor's report will not be provided until after the MS II decision.

The DRPM AAA's status as the Service evaluator for LFT&E is less than optimal. The difficulties may be attributed to the lack of an independent agency within the Marine Corps responsible for LFT&E. However, the current Test and Evaluation Working Integrated Product Team process used by the Program Office may mitigate this oversight risk and the appearance of conflict of interest with the PM being its own evaluator.

